Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Prairie Pest Monitoring Network

Owen Olfert et al.

AAFC - Saskatoon

Canada

PRAIRIE PEST MONITORING NETWORK

- **PPMN** is a coordinated suite of activities (monitoring; technology transfer; research) related to insect pests of field crops and natural enemies
- The objectives are to:
  - ✓Develop standardized monitoring protocols
  - ✓Monitor existing/emerging insect populations
  - ✓Forecast pest status / issue timely risk warnings
  - ✓Assess and quantify crop - insect - weather interactions

PRAIRIE PEST MONITORING NETWORK

Current NETWORK Members

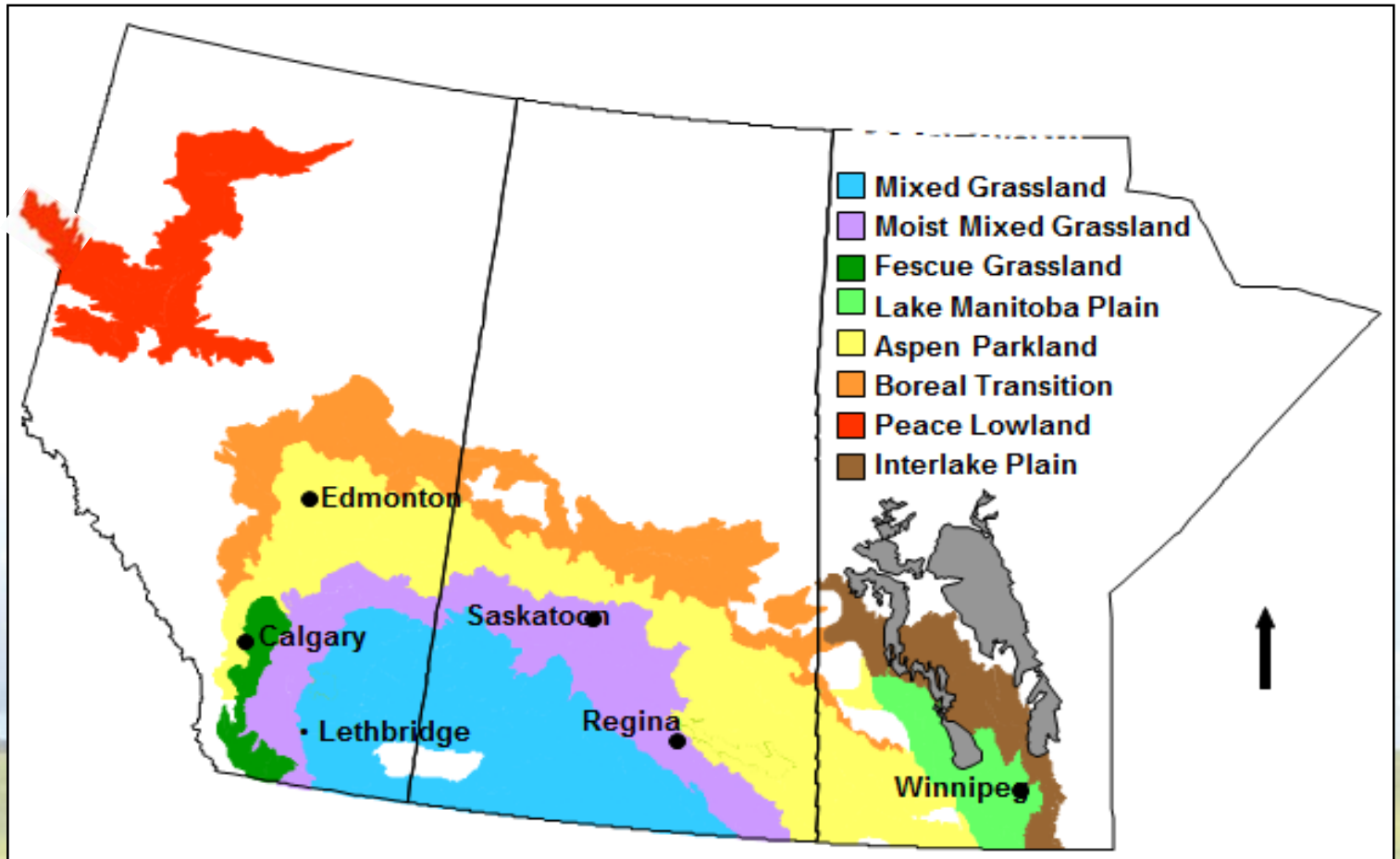
- ✓ Provincial Entomologists – J. Gavloski, S. Hartley, S. Meers, A. Benn
- ✓ Producers – Manitoba, Saskatchewan, Alberta, B.C. Peace
- ✓ Environment Canada – S. Trudel
- ✓ Industry agronomists – Canola Council, SK Crop Insurance
- ✓ AAFC – O. Olfert, J. Otani, R. Weiss, N. Melnychuk, L. Andreassen, J. Soroka, H. Cárcamo, K. Floate

FUNDING

THE PEST CHALLENGE

Production area is extensive in Prairie Ecosystem

- ✓ ~30 million ha in crop land
- ✓ Eight distinctive ecoregions



THE PEST CHALLENGE

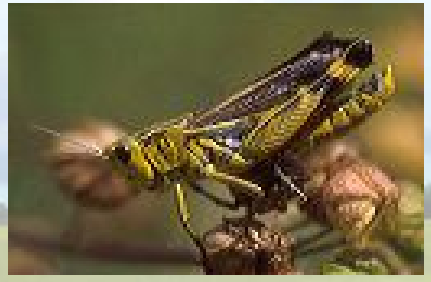
Prairie Ecozone contains a large complex of crop pests; rarely are there outbreaks of multiple species

Pest status can be extremely variable due to a number of factors

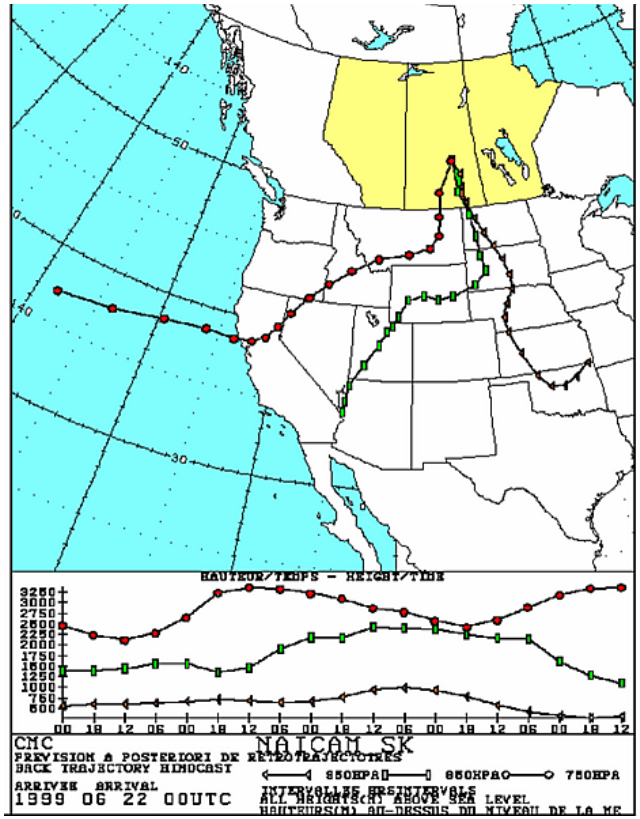
- ✓ Abiotic Factors (e.g. temperature, moisture, winds)
- ✓ Food Supply (e.g. crops and alternate sources)
- ✓ Suitable Habitat (e.g. overwintering, egg-laying)
- ✓ Natural Enemies

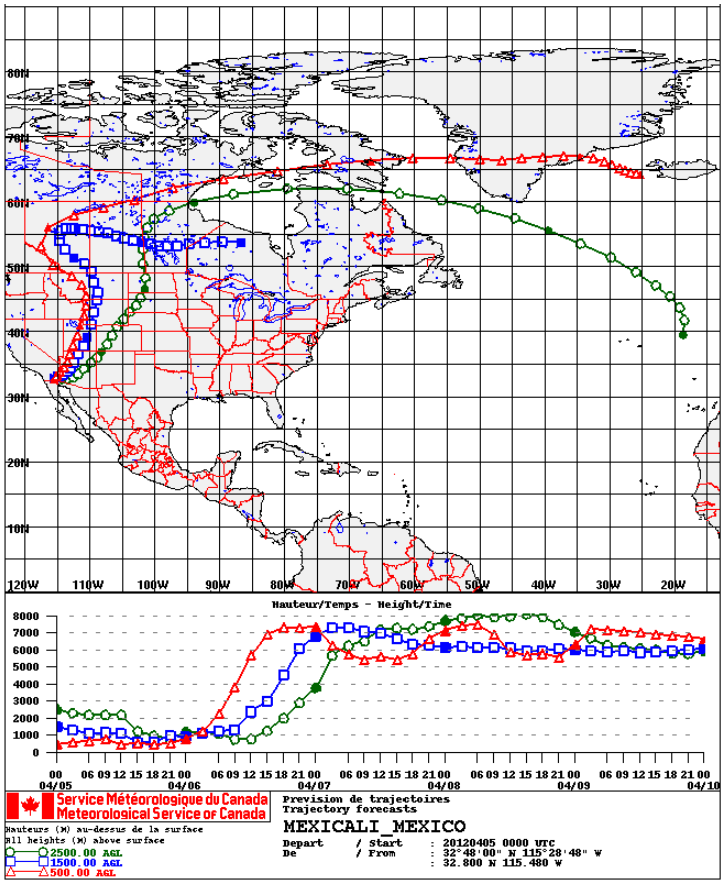
THE PEST CHALLENGE

- Indigenous Insect Species
  - ✓ Example: Grasshoppers (Orthoptera: Acrididae)
- Invasive Alien Pest Species
  - ✓ Example: Swede midge (*Contarinia nasturtii*)
- Migratory Pest Species
  - ✓ Example: Diamondback moth (*Plutella xylostella*)



WIND TRAJECTORY –
Collaboration with EC

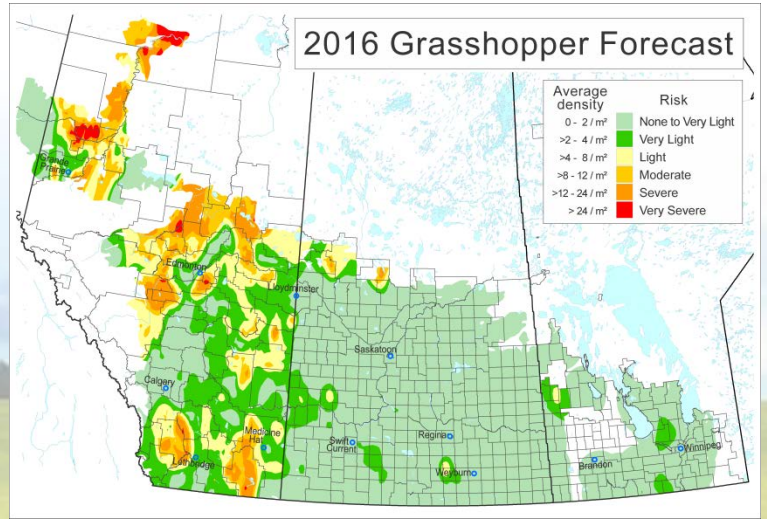




Infestations in Canada occur when suitable winds carry adult insects northward from U.S.A. or Mexico

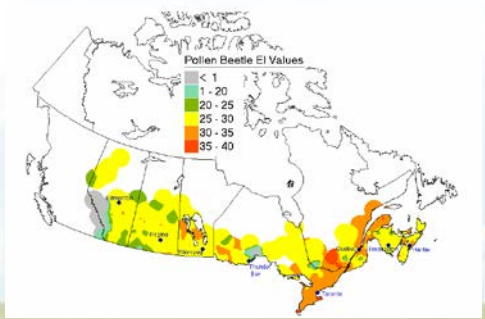
SURVEYS – Annual Forecasts

- Snapshot in time; depending on a number of factors, will reflect the future to varying degrees
  - ✓ *Data are frequently translated into qualitative terms such as "**light infestation**", etc.*
- Continuity is important - data are used to understand dynamics of pests within farming systems



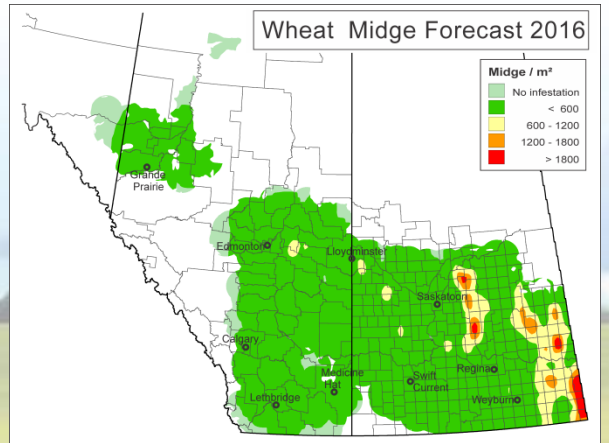
RISK WARNINGS

- Consist of bringing forward ***annual survey data*** from the previous year and providing an update with current crop and weather information
- Employ models that have been developed to predict insect and crop response to environmental factors



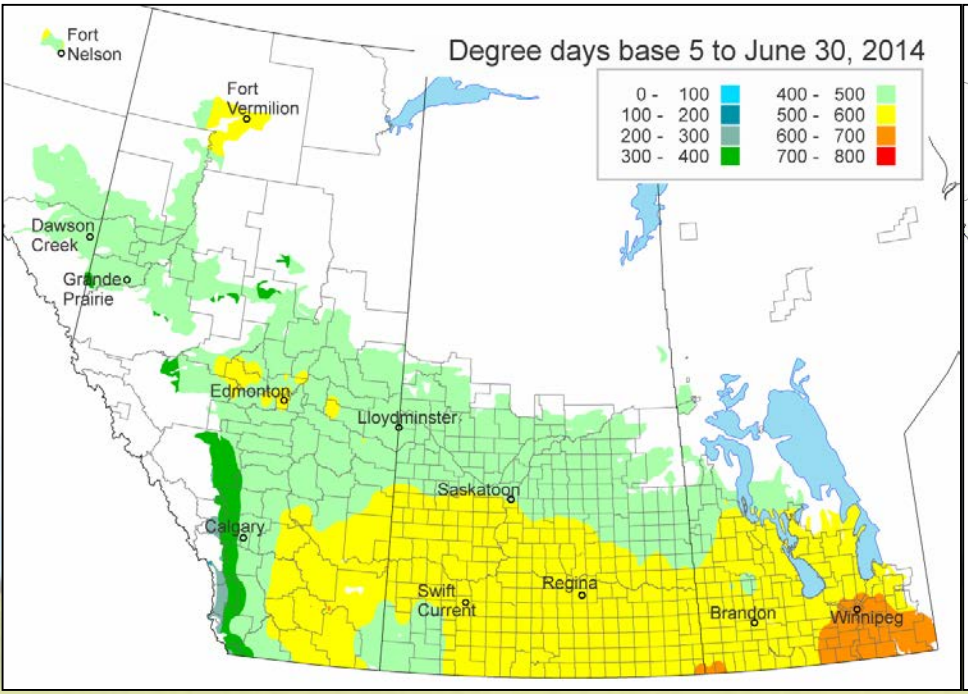
RISK WARNINGS - Example

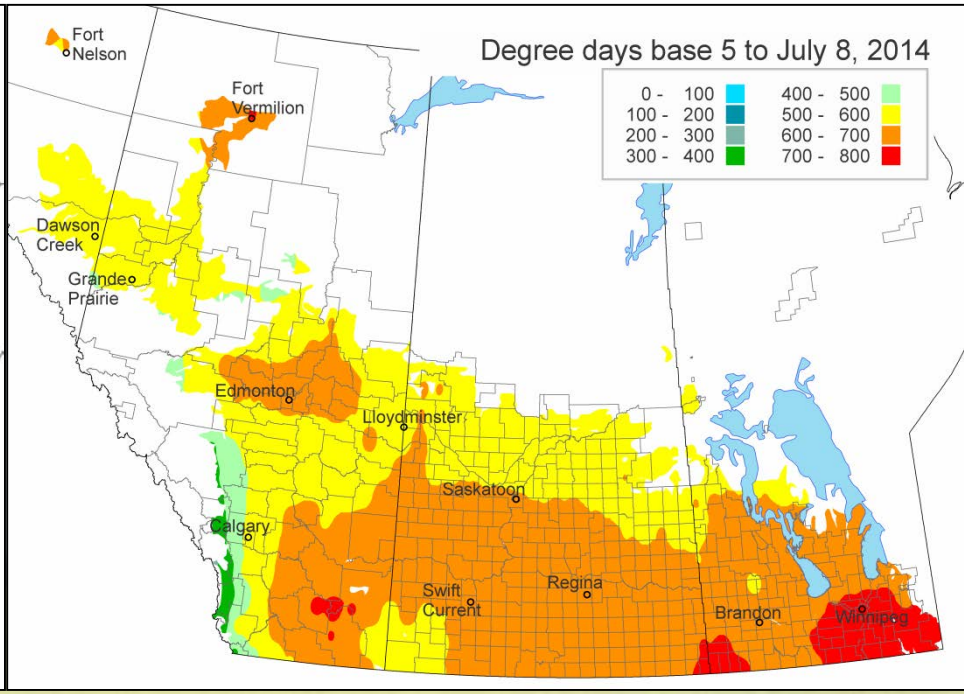
- Soil survey of wheat midge cocoons from previous crop year
  - ✓ pest and parasitoid population distribution/density
- Meteorological data requirements
  - ✓ min/max daily air temperatures
  - ✓ model output of accumulated degree-days (> 5^{o}C)
- Forecast
  - ✓ emergence of adults in relation to host plant phenology



RISK WARNING - Wheat Midge

- Example
  - ✓ *10% adult midge emergence ≅ 693º C*
  - ✓ *50% adult midge emergence ≅ 784º C* (Elliott et al.)





NETWORK - Annual Surveys

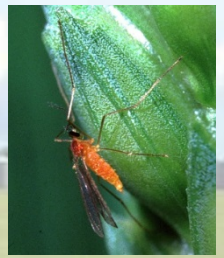
- ✓ *Grasshoppers*
- ✓ *Bertha Armyworm*
- ✓ *Wheat Midge*
- ✓ *Cabbage Seedpod Weevil*
- ✓ *Pea Leaf Weevil*
- ✓ *Wheat Stem Sawfly*
- ✓ *Leafhoppers*
- ✓ *Diamondback moth*
- ✓ *Flea Beetles*
- ✓ *Swede Midge*

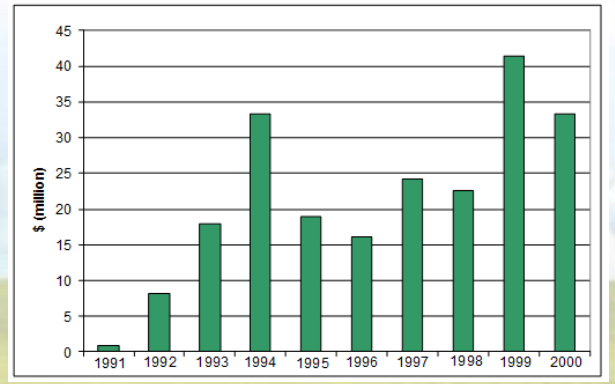
NETWORK – Biological Control

- **Predators**
  - ✓Ladybird beetles
  - ✓Damsel bugs
  - ✓Lacewings
  - ✓Pirate bugs
  - ✓Ground beetles
- **Parasitoids**
  - ✓Wasps
  - ✓Flies
- **Diseases**
  - ✓Fungi
  - ✓Viruses

WHEAT MIDGE – Parasitoid example

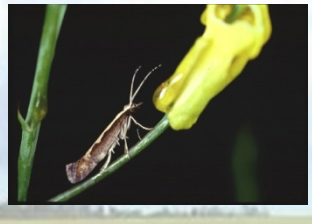
- ✓ *Macroglenes penetrans* discovered in SK in 1984
- ✓ Mean rates of parasitism in SK (2001-2015) ranged from 25 - 46%
- ✓ 1991-2000, ~15.5 million ha of wheat did not require a pesticide application due to parasitism
- ✓ Total saving in pesticide costs alone were > $200 million in the 1990s

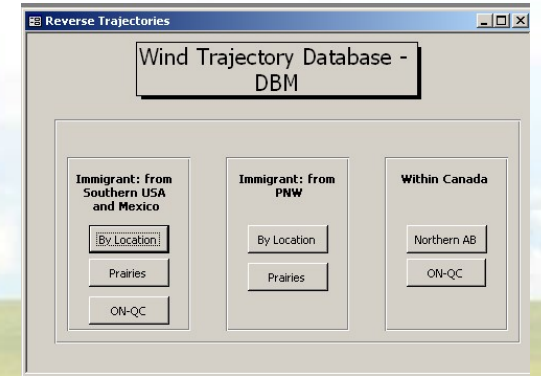




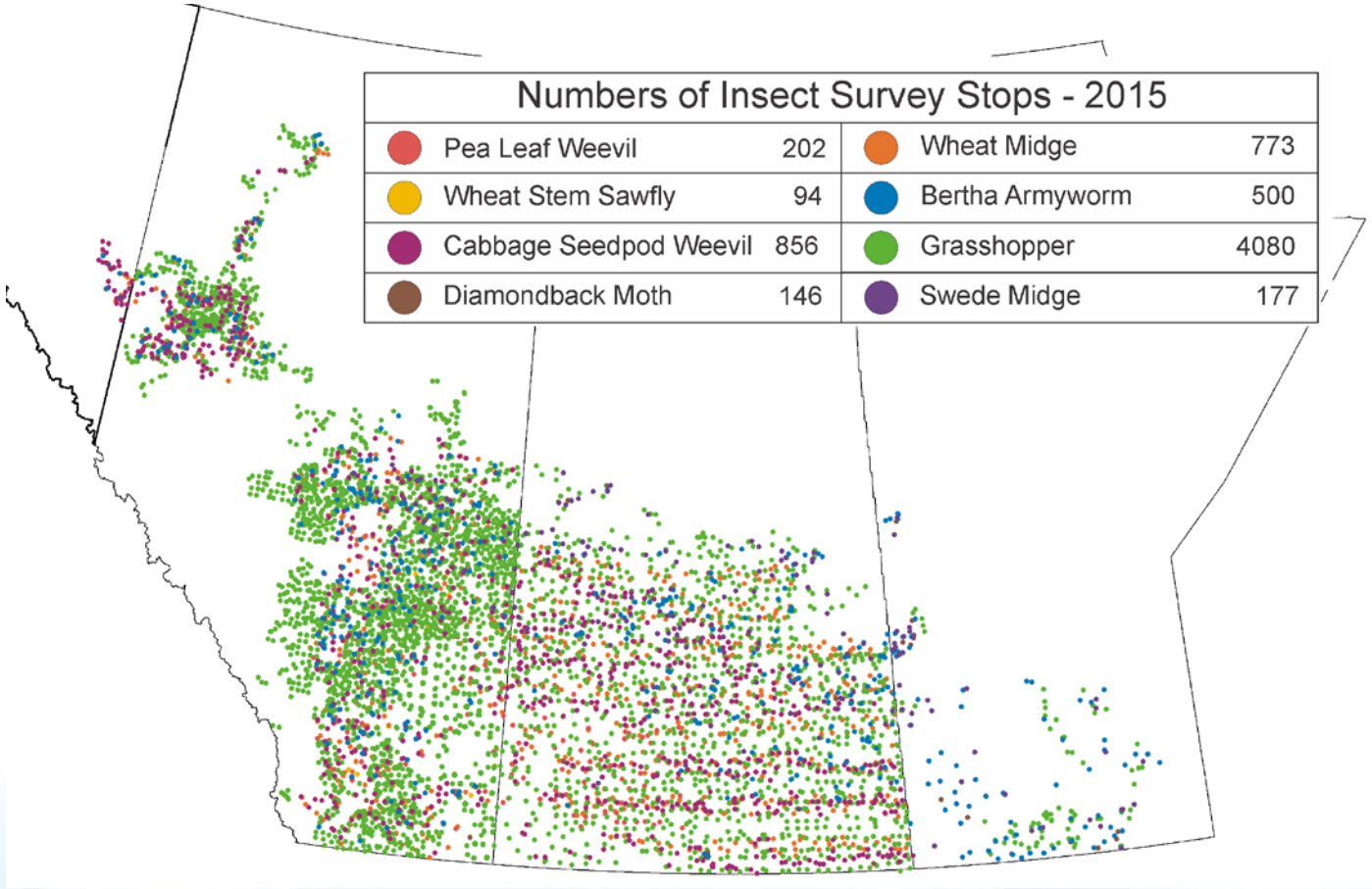
CONCLUDING COMMENTS

- ✓ All data generated is archived in a crop - insect - weather database
- ✓ Essentially we have a 30 million ha field trial within the prairie landscape



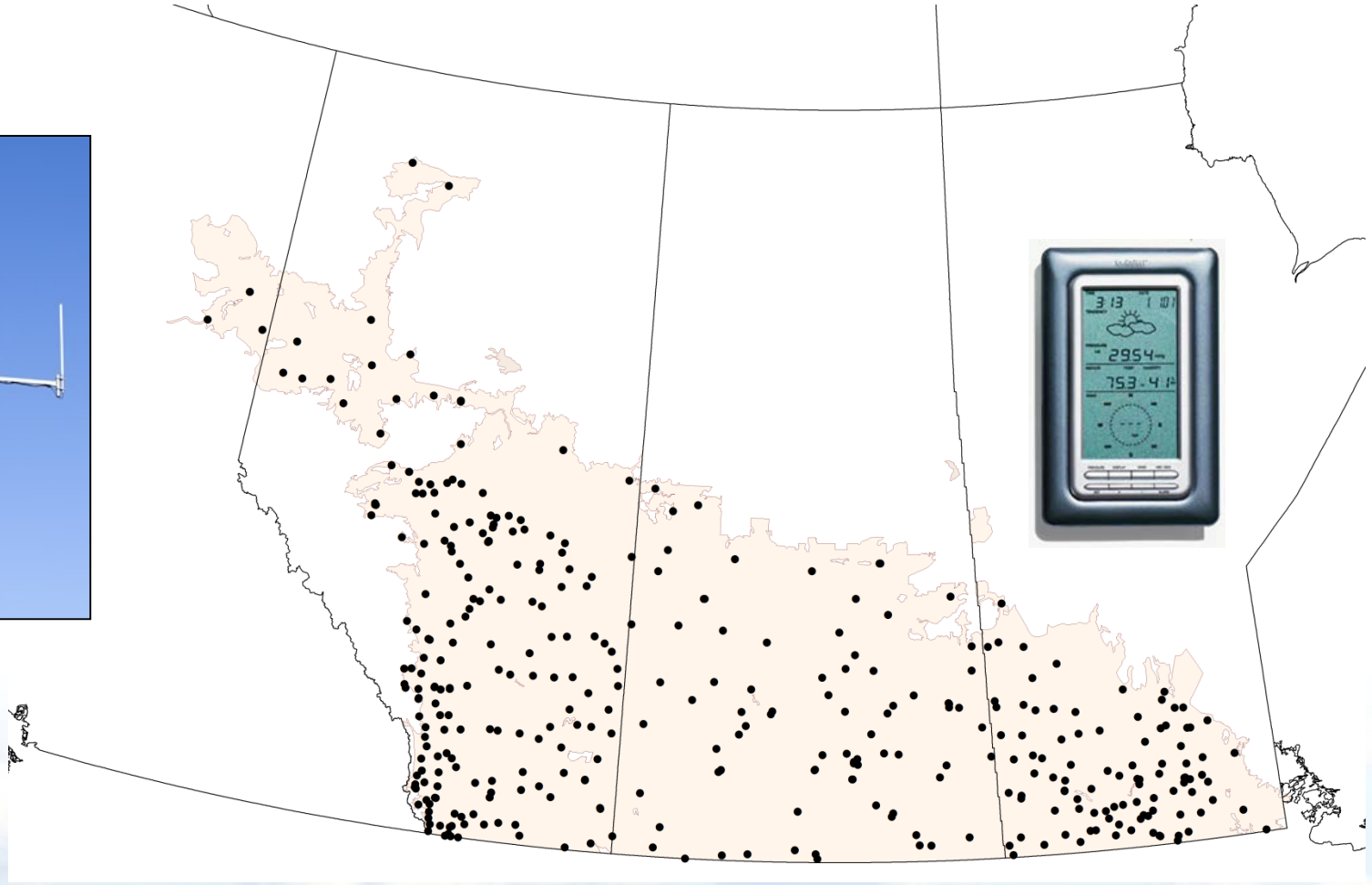


30 Million ha Field Trial



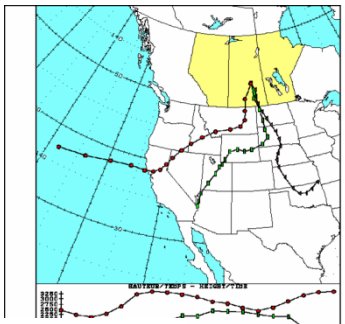
We have access annually to about 5000 insect population abundance/ distribution data points, together with crop and agronomic information

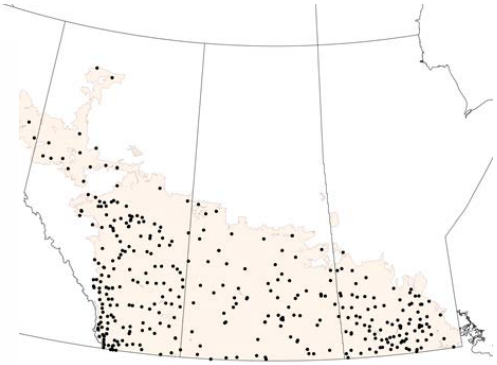
30 Million ha Field Trial

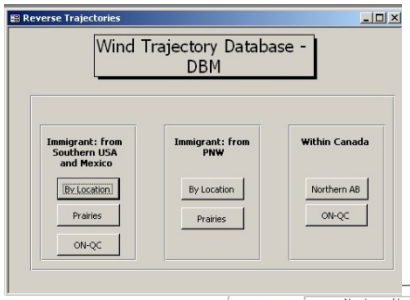


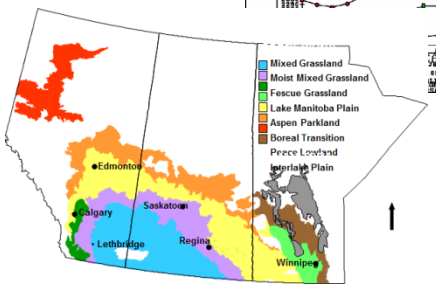
Hourly weather data are downloaded and archived during each growing season from 400 weather stations

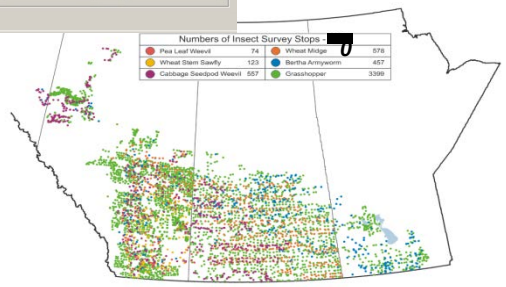
30 Million ha Field Trial





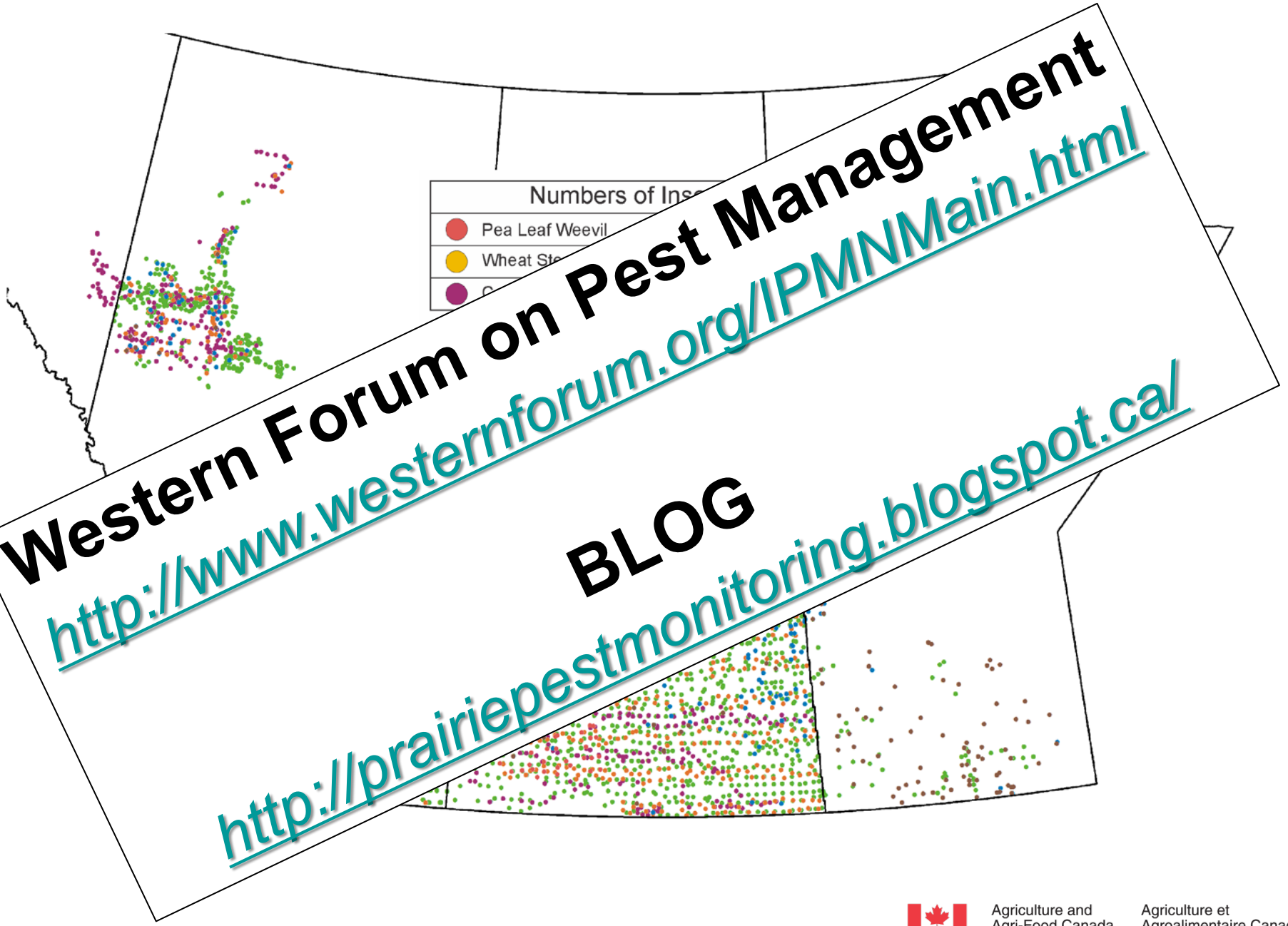






- ✓ The database is an significant resource for identifying gaps and developing management tools

- ✓ Potential is world class. Impacts of climate change, new agronomic practices and new crops on pests and beneficial insects are within its scope



Western Forum on Pest Management

http://www.westernforum.org/IPMNMain.html

BLOG

http://prairiepestmonitoring.blogspot.ca/

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